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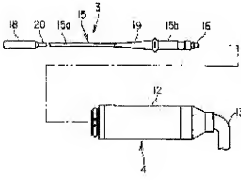
(54) APPARATUS AND METHOD FOR ULTRASONIC COAGULATING AND INCISING

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an apparatus and a method for ultrasonically coagulating and incising capable of instantaneously sufficiently coagulating and incising an organism tissue and rapidly incising the organism tissue.

SOLUTION: The apparatus for ultrasonically coagulating and incising comprises a heating section 20 provided at a peripheral site of a treating section 18 in a probe 15 for transmitting the ultrasonic vibration output from an ultrasonic vibrator to the section 18 at the ultrasonic vibration transmitting time.



CLAIMS

[Claim(s)]

[Claim 1]A supersonic vibration generating part which generates supersonic vibration.

A supersonic vibration transmission part which tells supersonic vibration which a treatment part in contact with a treatment part is allocated by tip part, and is outputted to it from said supersonic vibration generating part to said treatment part.

A gripping member supported between said treatment parts at a tip of this vibration transmission part so that grasping of a body tissue was possible.

It is the ultrasonic coagulotomy device provided with the above, and an exothermic part which generates heat at the time of transfer of supersonic vibration was provided in a circumference part of said treatment part in said supersonic vibration transmission part.

[Claim 2]A supersonic vibration generating part which generates supersonic vibration, comprising, A supersonic vibration transmission part which tells supersonic vibration which a treatment part in contact with a treatment part is allocated by tip part, and is outputted to it from said supersonic vibration generating part to said treatment part, An ultrasonic coagulotomy device provided with a gripping member connected with said treatment part at a tip of this vibration transmission part between said supersonic vibration transmission parts

so that grasping of a body tissue was possible.

Said gripping member is a rigid body.

A holding face in contact with said treatment part.

An elastic deformation body which carries out elastic deformation according to shape of said treatment part, and contacts said whole holding face to abbreviated homogeneity at said treatment part when it is interposed between these rigid bodies and holding faces and a body tissue is grasped.

[Claim 3]An ultrasonic coagulotomy method comprising:

A treatment part of a tip part of a supersonic vibration transmission part.

A gripping process which grasps a body tissue between gripping members.

A supersonic vibration transfer process of telling supersonic vibration outputted from a supersonic vibration generating part to said treatment part via said supersonic vibration transmission part.

An ultrasonic coagulating process which makes an exothermic part of a circumference part of said treatment part in said supersonic vibration transmission part generate heat at the time of transfer of said supersonic vibration, and solidifies a body tissue with heat of this exothermic part, An ultrasonic incision process of excising a body tissue by supersonic vibration transmitted to said treatment part by said supersonic vibration transmission part.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the ultrasonic coagulotomy device for the ultrasonic surgery which solidifies and cuts a body tissue open by use of supersonic vibration, and its method.

[0002]

[Description of the Prior Art]Generally, in the surgical operation, the ultrasonic coagulotomy device which used supersonic vibration as shown, for example in the Patent Publication Heisei No. 505801 [eight to] gazette is used widely. The gripping member is connected with the tip part of the probe which carries out supersonic

vibration to this ultrasonic coagulotomy device so that opening and closing are possible. And low-temperature coagulation of the body tissue is carried out with the frictional heat which is grasped in the state of pinching a body tissue and is produced in the grasping part of a body tissue between the tip part of a probe, and a gripping member at the time of transfer of supersonic vibration at the time of use of this device, and supersonic vibration cuts the solidifying part of this body tissue open further.

[0003]The device for coagulation treatment called the heat scalpel which was going to obtain the coagulation ability stable from the conventional electrotome is developed by adding a heat source to the treatment part of forceps as another conventional technology.

[0004]

[Problem(s) to be Solved by the Invention]In the conventional ultrasonic coagulotomy device, by the time the coagulation treatment which solidifies a body tissue is attained, the temperature of the treatment part in contact with a body tissue needs to reach constant temperature. And by the time the temperature of a treatment part rises to the temperature in which this coagulation treatment is possible, fixed waiting time will be needed. In actually performing coagulation treatment of a body tissue, after the temperature of a treatment part reaches a fixed coagulation treatment temperature in which coagulation treatment is possible, it will be necessary to carry out fixed time maintenance in the state of the fixed coagulation treatment temperature. Therefore, there is a problem to which the working hours which the coagulation treatment of a body tissue takes become long.

[0005]With conditions, such as the amount of retention spans of a body tissue, the size of the amplitude of a probe, frequency and a probe, and shape of a gripping member, time to hold at a fixed coagulation treatment temperature changes, and the quantity of the energy given to a body tissue also changes. Therefore, the quantity of the energy given to a body tissue at the time of treatment changes also depending on how to use the way person who operates a treatment part. For example, since the usage which makes it slide to right and left gradually grasping a blood vessel by the probe and a gripping member tends to miss the frictional heat generated between the probe and the body tissue, the working hours which the coagulation treatment of a body tissue takes become long. It may be cut open, being unable to solidify a blood vessel thoroughly as the result.

[0006]In performing the coagulation and incision of a large artery, a lumen organ, etc. especially, if a certain

fixed coagulation treatment temperature is not kept certain, in the treatment part which is grasping the body tissue, it turns out that sufficient coagulation is not made. Therefore, in order to obtain sufficient coagulation / incision capability, it will be greatly influenced not only depending on the capability of a device but depending on how to use a way person. This has a problem for which skill of operation is also needed undesirably also as user-friendliness of the way person at the time of a way person operating a device.

[0007]Although coagulation capability is enough, since there is [no incision function] a heat scalpel device, once it solidifies a body tissue, it has a problem for which the troublesome work which makes a solidifying part separate at another forceps or another process is needed.

[0008]Since a body tissue sticks at the tip of a scalpel easily at the time of the coagulation treatment by this heat scalpel device, while repeating use, it may be said that coagulation and incision capability will deteriorate.

[0009]This invention was made paying attention to the above-mentioned situation, and the purpose performs sufficient coagulation treatment of a body tissue in an instant, and it is in providing the ultrasonic coagulotomy device which can cut a body tissue open promptly, and its method.

[0010]

[Means for Solving the Problem]A supersonic vibration generating part which an invention of claim 1 makes generate supersonic vibration, and a supersonic vibration transmission part which a treatment part which contacts a treatment part at a tip part tells said treatment part that supersonic vibration which is allocated and is outputted from said supersonic vibration generating part is, In an ultrasonic coagulotomy device provided with a gripping member supported between said treatment parts at a tip of this vibration transmission part so that grasping of a body tissue was possible, It is an ultrasonic coagulotomy device providing an exothermic part which generates heat at the time of transfer of supersonic vibration in a circumference part of said treatment part in said supersonic vibration transmission part. And in an invention of this claim 1, it is made to perform sufficient coagulation treatment of a body tissue in an instant by making an exothermic part of a circumference part of a treatment part in a supersonic vibration transmission part generate heat at the time of transfer of supersonic vibration.

[0011]A supersonic vibration generating part which an invention of claim 2 makes generate supersonic vibration, and a supersonic vibration transmission part which a treatment part which contacts a treatment part

at a tip part tells said treatment part that supersonic vibration which is allocated and is outputted from said supersonic vibration generating part is, In an ultrasonic coagulotomy device which it had, a gripping member connected with said treatment part at a tip of this vibration transmission part between said supersonic vibration transmission parts so that grasping of a body tissue was possible said gripping member, It is interposed between a rigid body, holding faces in contact with said treatment part, and these rigid bodies and holding faces, When grasping a body tissue, it is an ultrasonic coagulotomy device possessing an elastic deformation body which carries out elastic deformation according to shape of said treatment part, and contacts said whole holding face to said treatment part at abbreviated homogeneity. When grasping a body tissue between a treatment part at a tip of a vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment, in an invention of this claim 2 And a rigid body of a gripping member, It is made to demonstrate the coagulotomy capability to have been stabilized, by carrying out elastic deformation of the elastic deformation body between holding faces in contact with a treatment part according to shape of a treatment part, and contacting the whole holding face to abbreviated homogeneity at a treatment part.

[0012]A gripping process in which an invention of claim 3 grasps a body tissue between a treatment part of a tip part of a supersonic vibration transmission part, and a gripping member, A supersonic vibration transfer process of telling supersonic vibration outputted from a supersonic vibration generating part to said treatment part via said supersonic vibration transmission part, An ultrasonic coagulating process which makes an exothermic part of a circumference part of said treatment part in said supersonic vibration transmission part generate heat at the time of transfer of said supersonic vibration, and solidifies a body tissue with heat of this exothermic part, It is the ultrasonic coagulotomy method providing an ultrasonic incision process of excising a body tissue, by supersonic vibration transmitted to said treatment part by said supersonic vibration transmission part. And in an invention of this claim 3, after grasping a body tissue by a gripping process between a treatment part of a tip part of a supersonic vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment, supersonic vibration outputted from a supersonic vibration generating part is told to a treatment part via a supersonic vibration transmission part at a supersonic vibration transfer process. An exothermic part of a circumference part of a treatment part in a supersonic vibration transmission part is made to generate heat according to an ultrasonic coagulating process at the time of

transfer of this supersonic vibration, and a body tissue is solidified with heat of this exothermic part. Then, at an ultrasonic incision process, it is made to excise a body tissue by supersonic vibration transmitted to a treatment part by supersonic vibration transmission part.

[0013]

[Embodiment of the Invention]Hereafter, a 1st embodiment of this invention is described with reference to drawing 1 thru/or drawing 4. Drawing 1 shows the handpiece 1 of the ultrasonic coagulotomy device of this embodiment. This handpiece 1 is provided with the handle unit 2 shown in drawing 2, and the probe unit 3 and the vibrator unit 4 which are shown in drawing 3. And each above-mentioned units 2, 3, and 4 of the handpiece 1 of this ultrasonic coagulotomy device are assembled by the state which shows by drawing 1.

[0014]As shown in drawing 2, the operating section body 6 with the vibrator attaching part 5, the stationary handle 7 by the side of front [which was fixed to this operating section body 6], and the movable handle 8 of the rotating backside are formed in the handle unit 2. Here, the movable handle 8 is pivoted by the axial pin 9 screwed to the operating section body 6, and can be rotated now.

[0015]The base end of the long and slender insertion sheath part 10 is connected with the front end of the operating section body 6 via the rotating knob 11. Here, the insertion sheath part 10 and the rotating knob 11 are attached pivotable in same axle to the operating section body 6.

[0016]As shown in drawing 3, the ultrasonic vibrator (supersonic vibration generating part) is arranged in the cylindrical cover 12 at the vibrator unit 4. For example, this ultrasonic vibrator contained the element which changes an electrical signal into mechanical oscillation, it is formed with the Langevin type ultrasonic vibrator. The phon is connected with the front end of this ultrasonic vibrator. And the rear end part of the probe unit 3 thrusts at the tip of this phon, and it is connected in the state. The end part of the high frequency supply code 13 is connected to the electrode of an ultrasonic vibrator. The other end of this high frequency supply code 13 is connected to the electric power unit 14 of an RF generator as shown in drawing 1.

[0017]The cylindrical probe (vibration transmitting member) 15 which transmits supersonic vibration is formed in the probe unit 3. This probe 15 has high sound effects, and is formed with a good titanium material, an aluminum material, etc. of biocompatibility. And the connecting part 16 which stuffs the phon of the front end of an ultrasonic vibrator in the rear end part of this probe 15, and is connected in the state is formed.

[0018]The probe 15 is constituted by the tip flank article 15a and the back end flank article 15b. Adhesion connects with the screw clamp fixed between these two parts 15a and 15b.

[0019]Drawing 4 shows the transmission state of the supersonic vibration of the probe unit 3. The 0th abdomen 17a that serves as a belly of vibration in the position of the connecting part 16 of the rear end part of the probe unit 3 here, The 1st knot part 17b that serves as a paragraph of vibration in the approximately central position of the back end flank article 15b, The 1st abdomen 17c used as the belly of vibration, the second-article part 17d which serves as a paragraph of vibration in the approximately central position of the tip flank article 15a, and the 2nd abdomen 17e used as the belly of vibration in the position of the tip part of the tip flank article 15a are arranged at the connecting part of the tip flank article 15a and the back end flank article 15b, respectively. And between the 0th abdomen 17a and the 1st abdomen 17c is the half-wave length, and the probe 15 of this embodiment comprises the back end flank article 15b. Between the 1st abdomen 17c and the 2nd abdomen 17e is the half-wave length, and comprises the tip flank article 15a.

[0020]The treatment part 18 in contact with a treatment part is allocated by the tip part of the probe 15. The outside diameter size D1 of this treatment part 18 is formed in bigger shape (D1>D2) than the outside diameter size D2 of other portions of the nearly tip of the probe 15. Therefore, this treatment part 18 has the large mass per unit length.

[0021]The amplitude of the supersonic vibration generated with the ultrasonic vibrator is transmitted to this probe 15. Here, between the 1st knot part 17b of the probe 15, and the 1st abdomen 17c, the shape 19 to which the transformation ratio of amplitude is made to expand, for example, a taper taper part, is formed. And the supersonic vibration generated with the ultrasonic vibrator is told to the treatment part 18 where amplitude is expanded via this probe 15.

[0022]For vibration system, it will be in the state where load was applied at the tip of the probe 15, by enlarging mass of the treatment part 18 arranged near the 2nd abdomen 17e of the probe 15. Therefore, at the time of an ultrasonic oscillation, bigger pressure fluctuation can be added at which place between the 2nd abdomen 17e from the second-article part 17d or the second-article part 17d, and generation of heat can be produced locally. Thereby, the exothermic part 20 which generates heat at the time of transfer of supersonic vibration is formed in the circumference part of the treatment part 18 in the probe 15. And heat transfer of the heat of this

exothermic part 20 is carried out to the treatment part 18 with a thick outer diameter at the tip of the probe 15.

[0023]When the units 2, 3, and 4 are assembled to the assembly state shown by drawing 1, the treatment part 18 at the tip of the probe 15 is projected from the tip part of the insertion sheath part 10 of the handle unit 2 in an outer side. And the jaw (gripping member) 21 currently supported between this treatment part 18 so that grasping of a body tissue is possible is allocated by the tip part of the insertion sheath part 10 of the handle unit 2. Here, the base end of the jaw 21 is connected with the tip part of the insertion sheath part 10 rotatable via the pivot 22.

[0024]Inside the insertion sheath part 10, the operation driving shaft of the shape of a wire which operates this jaw 21 which is not illustrated is allocated. And the base end of the jaw 21 is connected with the tip part of this operation driving shaft. The base end of this operation driving shaft is connected with the movable handle 8. And by being interlocked with operation of this movable handle 8, and an operation driving shaft's pushing on shaft orientations, and carrying out length operation, according to the moving operation of the shaft orientations of this operation driving shaft, a rotation drive is carried out a center [the pivot 22], and switching operation of the jaw 21 is carried out to the treatment part 18 at the tip of the probe 15. Thereby, between the treatment parts 18 at the tip of the probe 15, the jaw 21 is supported so that grasping of a body tissue is possible.

[0025]Next, an operation of the above-mentioned composition is explained. At the time of use of the handpiece 1 of the ultrasonic coagulotomy device of this embodiment, the handle unit 2, the probe unit 3, and the vibrator unit 4 are assembled by the assembly state shown by drawing 1. Ultrasonic coagulotomy treatment of a body tissue is performed in this state.

[0026]At the time of ultrasonic coagulotomy treatment, the gripping process which grasps a body tissue is performed first. In this gripping process, operation of making the movable handle 8 opening and closing to the stationary handle 7 of the handle unit 2 is performed. By being interlocked with the operation which closes the open movable handle 8, and carrying out hauling operation of the operation driving shaft at the hand side, according to the moving operation of the shaft orientations of this operation driving shaft, a rotation drive is carried out a center [the pivot 22], and the jaw 21 is closed-operated to the treatment part 18 at the tip of the probe 15 at this time. Thereby, a body tissue is grasped between the jaw 21 and the treatment part 18 at the tip of the probe 15.

[0027]Thus, after grasping a body tissue between the probe 15 and the jaw 21, a supersonic vibration transfer process is performed. At this supersonic vibration transfer process, the supersonic vibration outputted from an ultrasonic vibrator is told to the treatment part 18 via the probe 15. The ultrasonic coagulating process to which it acts as a protein coagulation strange student of the grasping part of a body tissue with the frictional heat produced between the treatment part 18 of the probe 15 which grasps a body tissue at the time of transfer of this supersonic vibration, and the jaw 21 is performed.

[0028]At the time of an ultrasonic oscillation, mass by the supersonic vibration of the treatment part 18 of the large probe 15 The second-article part 17d of this probe 15, Or bigger pressure fluctuation is added at which place between the 2nd abdomen 17e, and generation of heat arises from the second-article part 17d locally in the exothermic part 20 of the circumference part of the treatment part 18 in the probe 15. Heat transfer of the heat of this exothermic part 20 is carried out to the treatment part 18 at the tip of the probe 15. And according to this ultrasonic coagulating process, the exothermic part 20 of the circumference part of the treatment part 18 at the tip of the probe 15 is made to generate heat, and the heat of this exothermic part 20 can be used for the coagulation of a body tissue.

[0029]An end of the coagulation treatment of a body tissue will perform an ultrasonic incision process after that. Excision of a body tissue is performed at this ultrasonic incision process by the cutting work by the supersonic vibration transmitted to the treatment part 18 by the probe 15.

[0030]The temperature of the exothermic part 20 which generates heat at the time of the coagulotomy treatment of a body tissue is controlling an output at 80 ** - about 250 **, and more effective coagulation / incision ability is obtained. The capability for the temperature of the exothermic part 20 at this time to have been stabilized when around 130 ** was preferred in the time of the treatment of oviduct coagulation etc. for example, and there was generation of heat of not less than 100 ** at the time of the treatment of coagulation junction [of a blood vessel or an organ] - and incision is demonstrated.

[0031]However, since heat transfer will progress also to portions other than tip treatment part 18 if the temperature of the exothermic part 20 becomes an elevated temperature too much not much, unusual change of resonance frequency is produced and supersonic vibration becomes impossible. Since there is a possibility of having a thermal effect, by contact with the body tissue which the treatment part 18 of the probe 15 does not

mean, the field of the exothermic part 20 which generation of heat at the tip of the probe 15 produces shall be around 20 mm, and it will be in the optimal condition of use to control exothermic temperature at 200 ** or less.

[0032]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, since the exothermic part 20 which generates heat at the time of transfer of supersonic vibration was formed in the circumference part of the treatment part 18 in the probe 15 in the handpiece 1 of the ultrasonic coagulotomy device of this embodiment, the exothermic part 20 at the tip of the probe 15 can be made to generate heat by adding supersonic vibration. Therefore, where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment, The frictional heat produced between the probe 15 and a body tissue and the heat of the exothermic part 20 can contribute to a body tissue complexly, and treatment which fully solidifies a body tissue can be performed in an instant in a short time. A body tissue is speedily detachable in an operation of supersonic vibration by maintaining the state where the body tissue was grasped between the probe 15 and the jaw 21.

[0033]Drawing 5 shows the 1st modification of the probe unit 3 of the ultrasonic coagulotomy device of a 1st embodiment. The probe unit 3 of this modification changes the shape of the probe 15 of a 1st embodiment a little as follows.

[0034]That is, in this modification, the shape 19 to which the transformation ratio of amplitude is made to expand, for example, a taper taper part, is formed like a 1st embodiment between the 1st knot part 17b of the probe 15, and the 1st abdomen 17c.

[0035]In this modification, the transformation ratio limb [major diameter / outside diameter size / of this treatment part 18] 31 is formed behind the treatment part 18 at the tip of the probe 15. And near the second-article part 17d of the probe 15, the transformation ratio of amplitude is expanded by this transformation ratio limb 31.

[0036]In this modification, bigger pressure fluctuation (amplitude) is added at the place near the second-article part 17d of this probe 15 by the supersonic vibration of the transformation ratio limb 31 of the probe 15 with large mass at the time of supersonic vibration transfer of the probe 15. Therefore, since generation of heat arises locally in the transformation ratio limb 31 in the probe 15, heat transfer of the heat of this transformation

ratio limb 31 is carried out to the treatment part 18 at the tip of the probe 15.

[0037]Then, the following effect is done so if it is in the thing of the above-mentioned composition. Namely, where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment in this modification, Since the frictional heat produced between the probe 15 and a body tissue and the heat by which heat transfer is carried out to the treatment part 18 from the transformation ratio limb 31 can be made to contribute to a body tissue complexly, treatment which fully solidifies a body tissue in this modification as well as a 1st embodiment can be performed in an instant in a short time.

[0038]Drawing 6 shows the 2nd modification of the probe unit 3 of the ultrasonic coagulotomy device of a 1st embodiment. The probe unit 3 of this modification changes the shape of the probe 15 of a 1st embodiment a little as follows.

[0039]That is, in the probe 15 of this modification, the greatest outer diameter part 41 of this probe 15 is formed between the 0th abdomen 17a of the back end flank article 15b, and the 1st knot part 17b. The minimum outside diameter part 42 whose outside diameter size D4 is sufficiently smaller than the outside diameter size D3 of the maximum outer diameter part 41 of the back end flank article 15b is formed in the tip flank article 15a of the probe 15 of this modification.

[0040]Therefore, since amplitude magnifying power becomes large enough in the probe 15 of this modification and the load stress state near the 2nd abdomen 17e also increases excessively, Generation of heat is produced near the 2nd abdomen 17e as a result, the heat is transmitted to the treatment part 18 at the tip of the probe 15, and good coagulation / incision capability can be obtained.

[0041]Drawing 7 (A) - (C) shows a 2nd embodiment of this invention. This embodiment changes the composition of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0042]That is, at this embodiment, the tip flank article 15a of the half-wave length applied to the 2nd abdomen 17e from the 1st abdomen 17c of the probe 15 as shown in drawing 7 (A) is constituted from the 0th abdomen 17a by the member of another construction material in the back end flank article 15b of the half-wave length applied to the 1st abdomen 17c. For example, although titanium alloy:Ti-6aluminum-4Va is generally used as a

material of an ultrasonic transfer member, as for the tip flank article 15a covered over the 2nd abdomen 17e from the 1st abdomen 17c, the stainless alloy is used in this embodiment.

[0043]This stainless alloy becomes possible [resonating, since a titanium alloy and specific acoustic impedance (density x acoustic velocity) are almost equal]. For example, since internal friction in a stainless material will be accumulated at an early stage from a titanium material if the amplitude of the supersonic vibration of the probe unit 3 makes not less than 50 micrometers output greatly, quantity of heat is accumulated near the second-article part 17d, and generation of heat can be generated easily. Therefore, since heat transfer of this heat can be carried out throughout treatment part of tip of probe 15 18, the effect as a 1st embodiment that this embodiment is also the same is acquired. As a different raw material from a titanium alloy, even if it uses carbon steel, an aluminum alloy material, etc. besides a stainless alloy, the same effect is acquired.

[0044]The surface of the tip flank article 15a covered over the 2nd abdomen 17e from the 1st abdomen 17c is coated for example, with the Teflon coating material which is antisticking material which prevents a body tissue from adhering. It can prevent a body tissue adhering to the probe 15 which generated heat enough by this, and barring coagulation and separation.

[0045]In this embodiment, as shown in drawing 7 (B), the peripheral face side of the treatment part 18 at the tip of the probe 15 is attached to the probe protect member 51 of approximately semicircle shape to wrap sectional shape by the tip part of the insertion sheath part 10 of the handle unit 2 fixed. This probe protect member 51 is arranged in the jaw 21 in the opposite hand, as shown in drawing 7 (C).

[0046]Then, the following effect is done so if it is in the thing of the above-mentioned composition. Namely, in this embodiment, since the wrap probe protect member 51 was formed, the peripheral face side of the treatment part 18 at the tip of the probe 15, At the time of ultrasonic coagulotomy treatment, the probe protect member 51 can be arranged between body tissues other than the treatment part around the treatment part 18 at the tip of the probe 15, and the probe 15. Therefore, even if it is a case where the treatment part 18 at the tip of the probe 15 generates heat to an elevated temperature, the treatment part 18 at the tip of the probe 15 can be prevented from contacting body tissues other than the treatment part which a way person does not mean.

[0047]Although the probe protect member 51 is attached to the tip part of the insertion sheath part 10 of the

handle unit 2 fixed, this probe protect member 51 may be attached to the tip part of the insertion sheath part 10 removable. In this case, exchange also becomes possible according to wear of the probe protect member 51, and the state of dirt.

[0048]Drawing 8 shows a 3rd embodiment of this invention. This embodiment changes the composition of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0049]That is, the obedient member 61 is being fixed to the treatment part 18 at the tip of the probe 15 in this embodiment. The material of this obedient member 61 has Teflon (registered trademark), preferred silicone rubber or heat-resistant plastic material, etc., for example. And in this embodiment, adhesion fixing of the obedient member 61 is carried out to the treatment part 18 at the tip of the probe 15. The fixing method of the obedient member 61 may not be limited to adhesion fixing, and may be screw fixation etc.

[0050]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, since the obedient member 61 fixed to the treatment part 18 of the probe 15 of this embodiment cannot follow the supersonic vibration speed of the probe 15, the fixing face of the treatment part 18 at the tip of the probe 15 and the obedient member 61 produces friction by the supersonic vibration of the probe 15, and it generates heat remarkably. Therefore, this heat can be made to contribute to raising the coagulation ability of a body tissue.

[0051]Drawing 9 (A) - (C) thru/or drawing 10 (A) - (C) shows a 4th embodiment of this invention. This embodiment changes the composition of the jaw 21 of the tip part of the insertion sheath part 10 in the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0052]Namely, the base member 71 which comprises rigid bodies, such as metal and a plastic material, as the jaw 21 of this embodiment is shown in drawing 9 (B), It is arranged at the opposed face side with the treatment part 18 of the probe 15 in this base member 71, and comprises the contact-carrying member 72 which consists of **** material (for example, Teflon etc.) in contact with a body tissue, and the saccate member 73 which consists of an elastic body arranged among those both. Inner fillers, such as a gas, a fluid, or gel, are enclosed with this saccate member 73. And this saccate member 73 can change freely by flow of an inner filler.

[0053]Next, an operation of this embodiment of the above-mentioned composition is explained. At the time of use of the handpiece 1 of this embodiment, as shown in drawing 9 (C) with the operation which closes the movable handle 8 from the state which opened the jaw 21 as shown in drawing 9 (A), the jaw 21 is closed-operated and a body tissue is grasped between the treatment part 18 of the probe 15, and the jaw 21. Here, For example, as shown in drawing 10 (A), in grasping the body tissue H whose thickness is not uniform between the treatment part 18 of the probe 15, and the jaw 21, as the arrow a shows in drawing 10 (A). If the retention span at the time of closing the jaw 21 acts on the body tissue H, according to the shape of surface type of the body tissue H, the inner filler in the saccate member 73 will flow and change. Drawing 10 (B) shows the power c applied to the applied force b of probe 15 HE, and the inner filler in the saccate member 73 to the retention span a of the jaw 21 in the state of drawing 10 (A), respectively. And since the holding face of the contact-carrying member 72 can maintain a suitable contact state to the surface of the body tissue H in connection with the deforming operation of the saccate member 73 at this time, it is possible to transmit power uniform about the whole holding face of the contact-carrying member 72.

[0054]In addition, by choosing the construction material, thickness, etc. of the saccate member 73, and specifying tension, when it is going to grasp the body tissue H by the retention span beyond default value. As shown in drawing 10 (C), saccate member 73 the very thing expands, and the power beyond default value can be prevented from attaining to the body tissue H by missing stress by this inflating part 73a.

[0055]Drawing 11 (A) - (C) and drawing 12 (A) and (B) show the modification of the jaw 21 in the handpiece 1 of the ultrasonic coagulotomy device of a 4th embodiment (drawing 9 (A) refer to - (C) thru/or drawing 10 (A) - (C)). This modification forms H type saccate member 81 which formed the shape of the saccate member 73 of a 4th embodiment in the shape of an abbreviated H character as shown in drawing 11 (B). The side parts 81a and 81b of this H type saccate member 81 are arranged according to the lateral part of the base member 71 and the contact-carrying member 72, as shown in drawing 11 (A).

[0056]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, in this modification, when grasping the body tissue H between the treatment part 18 of the probe 15, and the jaw 21, as shown in drawing 12 (B), the deformation direction of H type saccate member 81 can be specified intentionally. Here, as shown in drawing 11 (D), when the saccate member 73 of approximately rectangular

shape is used, as it is shown in drawing 11 (E) at the time of modification of the saccate member 73 of this rectangular shape, when the center portion of this saccate member 73 swells, the stability of this saccate member 73 worsens. On the other hand, in H type saccate member 81 of this modification, the center portion of this H type saccate member 81 can be prevented from swelling also at the time of modification of this H type saccate member 81. Therefore, since the retention span which can raise more the stability of the holding face of the contact-carrying member 72, and joins the body tissue H by using H type saccate member 81 of this modification can be made uniformity and regularity, The stable coagulotomy capability can be demonstrated and the piece remainder etc. of the body tissue H by the modification which is not meant can be prevented.

[0057]Since wear by the holding face of the contact-carrying member 72 contacting the treatment part 18 of the probe 15 can also make it progress uniformly about the holding face whole region of the contact-carrying member 72, it is effective in the life of a product improving.

[0058]Drawing 13 and drawing 14 show a 5th embodiment of this invention. This embodiment changes the composition of the jaw 21 of the tip part of the insertion sheath part 10 in the handle unit 2 of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0059]Namely, the base member 91 formed with rigid bodies, such as stainless steel metal, as the jaw 21 of this embodiment was shown in drawing 14, It is arranged at the opposed face side with the treatment part 18 of the probe 15 in this base member 91, and is constituted by the contact-carrying member 92 which consists of **** material (for example, Teflon etc.) in contact with a body tissue, and the heating element (heater element) 93 pinched among those both. This heating element 93 is a Nichrome wire etc. which are not illustrated, and heat energy is transmitted and it generates heat.

[0060]Next, an operation of the above-mentioned composition is explained. In this embodiment, while the probe 15 is carrying out supersonic vibration, the output to the heating element 93 is impressed and the heating element 93 generates heat.

[0061]If a body tissue is grasped between the treatment part 18 of the probe 15, and the jaw 21 in this state, a body tissue is solidified with the heat from the heating element 93, and it can detach by the supersonic vibration of the probe 15 after that. ON/OFF of the output of the heating element 93 may synchronize with ON/OFF of supersonic vibration, and may be made to turn on and off according to a motion of the movable handle 8.

[0062]The heating element 93 of this embodiment is allocated in the back side of the contact-carrying member 92 which consists of a thin Teflon member, and heat transfer is carried out also to a side front. This heating element 93 is exposed to the surface of the contact-carrying member 92 which consists of Teflon material in part, and the convectivity to a body tissue increases further.

[0063]Then, since the heating element 93 was formed between the base member 91 of the jaw 21, and the contact-carrying member 92 if it was in the thing of the above-mentioned composition, Where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment, The frictional heat produced between the probe 15 and a body tissue and the heat of the heating element 93 can contribute to a body tissue complexly, and treatment which fully solidifies a body tissue can be performed in an instant in a short time. A body tissue is speedily detachable in an operation of supersonic vibration by maintaining the state where the body tissue was grasped between the probe 15 and the jaw 21.

[0064]As for this invention, it is needless to say that modification implementation can be variously carried out in the range which is not limited to the above-mentioned embodiment and does not deviate from the gist of this invention. Next, other characteristic technical matters of this application are written in addition as follows.

Account (additional remark paragraph 1) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, An ultrasonic coagulotomy device characterized by a part of treatment part of said ultrasonic transfer member itself generating heat in the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member.

[0065](Additional remark paragraph 2) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, In the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member, An ultrasonic coagulotomy device which solidifies a body tissue using a part of treatment part of said ultrasonic transfer member itself generating heat, and is characterized by performing organization excision by supersonic

vibration, and its method.

[0066](Additional remark paragraph 3) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, An ultrasonic coagulotomy device which comprises a holding face which consists of a saccate member which said gripping member turns into from a rigid body and an elastic body, and an obedient member in the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member.

[0067](Additional remark paragraph 4) Ultrasonic coagulotomy device with which a part of treatment part of said ultrasonic transfer member itself is characterized by in addition to this an ultrasonic transfer member being a dissimilar material in the additional remark paragraph 1.

[0068](Additional remark paragraph 5) Ultrasonic coagulotomy device characterized by coating a part of treatment part of said ultrasonic transfer member itself with the body tissue antisticking member in the additional remark paragraph 1.

[0069](Additional remark paragraph 6) Ultrasonic coagulotomy device provided with the heat transfer blocking member which a part of treatment part of said ultrasonic transfer member itself generates heat, and prevents the heat transfer to a body tissue in the additional remark paragraph 1.

[0070](Additional remark paragraph 7) Ultrasonic coagulotomy device, wherein the tip part mass of a treatment part itself [of said ultrasonic transfer member] is larger than the mass of a probe and makes it generate heat in the additional remark paragraph 1 at the time of supersonic vibration in addition to this.

[0071](Additional remark paragraph 8) Ultrasonic coagulotomy device characterized by a part of treatment part surface of said ultrasonic transfer member being 130 ** - 200 ** in the additional remark paragraph 1.

[0072](Additional remark paragraph 9) Ultrasonic coagulotomy device characterized by the body tissue prevention member of said ultrasonic transfer member being Teflon in the additional remark paragraph 5.

[0073](Additional remark paragraph 10) Ultrasonic coagulotomy device characterized by providing a heating element in said gripping member in the additional remark paragraph 1.

[0074](Technical field to which an invention belongs) This invention is an invention about an ultrasonic surgery apparatus, especially ultrasonic coagulation / incision device which solidifies and cuts a body tissue open by

use of an ultrasonic wave.

[0075](Conventional technology of the additional remark paragraphs 1-10) By the surgical operation, ultrasonic coagulation / incision device using supersonic vibration is used conventionally. This ultrasonic coagulation / incision device is a device which grasps a body tissue by the probe and gripping member which carry out supersonic vibration, is made to carry out low-temperature coagulation of the body tissue with the frictional heat produced there, and is cut open by supersonic vibration. By the time this device solidifies a body tissue, it needs to reach constant temperature, and fixed time is needed for reaching this temperature. After reaching constant temperature, it will be necessary to carry out fixed time maintenance.

[0076]The energies which give this time to a body tissue with the shape of the size of the amount of retention spans of an organization or the amplitude of a probe, frequency, a probe, or a gripping member differ. The energy given to a body tissue changes also depending on how to use a way person. For example, the usage to which right and left are made to slide gradually grasping a blood vessel by the probe and a gripping member misses a probe and the frictional heat generated among organizations, and also has a possibility of cutting it open being unable to solidify a blood vessel thoroughly as a result. In order to perform the coagulation and incision of a large artery, a lumen organ, etc. especially, if a certain constant temperature is not kept certain, in the treatment part which is grasping the body tissue, it turns out that sufficient coagulation is not made.

[0077]Therefore, in order to obtain sufficient coagulation / incision capability, it was greatly influenced not only with the capability of a device but with the way person's user-friendliness. The skill of operation of this thing is also needed undesirably also as a way person's user-friendliness.

[0078]here -- the device called the heat scalpel which was going to obtain the coagulation ability stable from the conventional electrotome is developed by adding a heat source to the conventional forceps treatment part as another art. Since the incision function is not held this device, once solidifying, it needed to make the solidifying part separate at another forceps or another process, although coagulation is enough. The coagulation of this device also had the problem that coagulation and incision capability will deteriorate, while repeating use, since an organization stuck at the tip of a scalpel.

[0079](The purpose of the additional remark paragraphs 1-10) This invention is made in view of the above-mentioned conventional technology, and sufficient coagulation is performed in an instant, and it comes

out about the invention of ultrasonic coagulation / incision device which can cut an organization open promptly.

[0080]

[Effect of the Invention]Since the exothermic part which generates heat at the time of transfer of supersonic vibration was provided in the circumference part of the treatment part in the supersonic vibration transmission part which tells the supersonic vibration outputted from a supersonic vibration generating part to the treatment part at a tip in contact with a treatment part according to the invention of claim 1, Sufficient coagulation treatment of a body tissue can be performed in an instant, and a body tissue can be promptly cut open.

[0081]When grasping a body tissue between the treatment part at the tip of a vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment according to the invention of claim 2, the rigid body of a gripping member, Since elastic deformation of the elastic deformation body between the holding faces in contact with a treatment part is carried out according to the shape of a treatment part and it was made to contact the whole holding face to abbreviated homogeneity at a treatment part, the coagulotomy capability to have been stabilized can be demonstrated.

[0082]According to the invention of claim 3, by a gripping process at the time of ultrasonic coagulotomy treatment The treatment part of the tip part of a supersonic vibration transmission part, After grasping a body tissue between gripping members, the supersonic vibration outputted from a supersonic vibration generating part is told to a treatment part via a supersonic vibration transmission part at a supersonic vibration transfer process, The exothermic part of the circumference part of the treatment part in a supersonic vibration transmission part is made to generate heat according to an ultrasonic coagulating process at the time of transfer of this supersonic vibration, By the supersonic vibration transmitted to a treatment part by the supersonic vibration transmission part at an ultrasonic incision process, after solidifying a body tissue with the heat of this exothermic part, since it was made to excise the body tissue, sufficient coagulation treatment of a body tissue can be performed in an instant, and a body tissue can be promptly cut open.

TECHNICAL FIELD

[Field of the Invention]This invention relates to the ultrasonic coagulotomy device for the ultrasonic surgery which solidifies and cuts a body tissue open by use of supersonic vibration, and its method.

PRIOR ART

[Description of the Prior Art]Generally, in the surgical operation, the ultrasonic coagulotomy device which used supersonic vibration as shown, for example in the Patent Publication Heisei No. 505801 [eight to] gazette is used widely. The gripping member is connected with the tip part of the probe which carries out supersonic vibration to this ultrasonic coagulotomy device so that opening and closing are possible. And low-temperature coagulation of the body tissue is carried out with the frictional heat which is grasped in the state of pinching a body tissue and is produced in the grasping part of a body tissue between the tip part of a probe, and a gripping member at the time of transfer of supersonic vibration at the time of use of this device, and supersonic vibration cuts the solidifying part of this body tissue open further.

[0003]The device for coagulation treatment called the heat scalpel which was going to obtain the coagulation ability stable from the conventional electrotome is developed by adding a heat source to the treatment part of forceps as another conventional technology.

EFFECT OF THE INVENTION

[Effect of the Invention]In the invention of claim 1, the exothermic part which generates heat at the time of transfer of supersonic vibration was provided in the circumference part of the treatment part in the supersonic vibration transmission part which tells the supersonic vibration outputted from a supersonic vibration generating part to the treatment part at a tip in contact with a treatment part.

Therefore, sufficient coagulation treatment of a body tissue can be performed in an instant, and a body tissue can be promptly cut open.

[0081]When grasping a body tissue between the treatment part at the tip of a vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment, in the invention of claim 2 The rigid body of a gripping member, According to the shape of a treatment part, elastic deformation of the elastic deformation body between the holding faces in contact with a treatment part is carried out, and it was made to contact the whole holding face to abbreviated homogeneity at a treatment part.

Therefore, the coagulotomy capability to have been stabilized can be demonstrated.

[0082]In the invention of claim 3, at the time of ultrasonic coagulotomy treatment, according to a gripping process The treatment part of the tip part of a supersonic vibration transmission part, After grasping a body tissue between gripping members, the supersonic vibration outputted from a supersonic vibration generating part is told to a treatment part via a supersonic vibration transmission part at a supersonic vibration transfer process, The exothermic part of the circumference part of the treatment part in a supersonic vibration transmission part is made to generate heat according to an ultrasonic coagulating process at the time of transfer of this supersonic vibration, After solidifying a body tissue with the heat of this exothermic part, at the ultrasonic incision process, it was made to excise the body tissue by the supersonic vibration transmitted to a treatment part by the supersonic vibration transmission part.

Therefore, sufficient coagulation treatment of a body tissue can be performed in an instant, and a body tissue can be promptly cut open.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the conventional ultrasonic coagulotomy device, by the time the coagulation treatment which solidifies a body tissue is attained, the temperature of the treatment part in contact with a body tissue needs to reach constant temperature. And by the time the temperature of a treatment part rises to the temperature in which this coagulation treatment is possible, fixed waiting time will be needed. In actually performing coagulation treatment of a body tissue, after the temperature of a treatment part reaches a fixed coagulation treatment temperature in which coagulation treatment is possible, it will be necessary to carry out fixed time maintenance in the state of the fixed coagulation treatment temperature. Therefore, there is a problem to which the working hours which the coagulation treatment of a body tissue takes become long.

[0005]With conditions, such as the amount of retention spans of a body tissue, the size of the amplitude of a probe, frequency and a probe, and shape of a gripping member, time to hold at a fixed coagulation treatment temperature changes, and the quantity of the energy given to a body tissue also changes. Therefore, the quantity of the energy given to a body tissue at the time of treatment changes also depending on how to use the way person who operates a treatment part. For example, since the usage which makes it slide to right and

left gradually grasping a blood vessel by the probe and a gripping member tends to miss the frictional heat generated between the probe and the body tissue, the working hours which the coagulation treatment of a body tissue takes become long. It may be cut open, being unable to solidify a blood vessel thoroughly as the result.

[0006]In performing the coagulation and incision of a large artery, a lumen organ, etc. especially, if a certain fixed coagulation treatment temperature is not kept certain, in the treatment part which is grasping the body tissue, it turns out that sufficient coagulation is not made. Therefore, in order to obtain sufficient coagulation / incision capability, it will be greatly influenced not only depending on the capability of a device but depending on how to use a way person. This has a problem for which skill of operation is also needed undesirably also as user-friendliness of the way person at the time of a way person operating a device.

[0007]Although coagulation capability is enough, since there is [no incision function] a heat scalpel device, once it solidifies a body tissue, it has a problem for which the troublesome work which makes a solidifying part separate at another forceps or another process is needed.

[0008]Since a body tissue sticks at the tip of a scalpel easily at the time of the coagulation treatment by this heat scalpel device, while repeating use, it may be said that coagulation and incision capability will deteriorate.

[0009]This invention was made paying attention to the above-mentioned situation, and the purpose performs sufficient coagulation treatment of a body tissue in an instant, and it is in providing the ultrasonic coagulotomy device which can cut a body tissue open promptly, and its method.

MEANS

[Means for Solving the Problem]A supersonic vibration generating part which an invention of claim 1 makes generate supersonic vibration, and a supersonic vibration transmission part which a treatment part which contacts a treatment part at a tip part tells said treatment part that supersonic vibration which is allocated and is outputted from said supersonic vibration generating part is, In an ultrasonic coagulotomy device provided with a gripping member supported between said treatment parts at a tip of this vibration transmission part so that grasping of a body tissue was possible, It is an ultrasonic coagulotomy device providing an exothermic part which generates heat at the time of transfer of supersonic vibration in a circumference part of said treatment

part in said supersonic vibration transmission part. And in an invention of this claim 1, it is made to perform sufficient coagulation treatment of a body tissue in an instant by making an exothermic part of a circumference part of a treatment part in a supersonic vibration transmission part generate heat at the time of transfer of supersonic vibration.

[0011]A supersonic vibration generating part which an invention of claim 2 makes generate supersonic vibration, and a supersonic vibration transmission part which a treatment part which contacts a treatment part at a tip part tells said treatment part that supersonic vibration which is allocated and is outputted from said supersonic vibration generating part is, In an ultrasonic coagulotomy device which it had, a gripping member connected with said treatment part at a tip of this vibration transmission part between said supersonic vibration transmission parts so that grasping of a body tissue was possible said gripping member, It is interposed between a rigid body, holding faces in contact with said treatment part, and these rigid bodies and holding faces, When grasping a body tissue, it is an ultrasonic coagulotomy device possessing an elastic deformation body which carries out elastic deformation according to shape of said treatment part, and contacts said whole holding face to said treatment part at abbreviated homogeneity. When grasping a body tissue between a treatment part at a tip of a vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment, in an invention of this claim 2 And a rigid body of a gripping member, It is made to demonstrate the coagulotomy capability to have been stabilized, by carrying out elastic deformation of the elastic deformation body between holding faces in contact with a treatment part according to shape of a treatment part, and contacting the whole holding face to abbreviated homogeneity at a treatment part.

[0012]A gripping process in which an invention of claim 3 grasps a body tissue between a treatment part of a tip part of a supersonic vibration transmission part, and a gripping member, A supersonic vibration transfer process of telling supersonic vibration outputted from a supersonic vibration generating part to said treatment part via said supersonic vibration transmission part, An ultrasonic coagulating process which makes an exothermic part of a circumference part of said treatment part in said supersonic vibration transmission part generate heat at the time of transfer of said supersonic vibration, and solidifies a body tissue with heat of this exothermic part, It is the ultrasonic coagulotomy method providing an ultrasonic incision process of excising a body tissue, by supersonic vibration transmitted to said treatment part by said supersonic vibration

transmission part. And in an invention of this claim 3, after grasping a body tissue by a gripping process between a treatment part of a tip part of a supersonic vibration transmission part, and a gripping member at the time of ultrasonic coagulotomy treatment, supersonic vibration outputted from a supersonic vibration generating part is told to a treatment part via a supersonic vibration transmission part at a supersonic vibration transfer process. An exothermic part of a circumference part of a treatment part in a supersonic vibration transmission part is made to generate heat according to an ultrasonic coagulating process at the time of transfer of this supersonic vibration, and a body tissue is solidified with heat of this exothermic part. Then, at an ultrasonic incision process, it is made to excise a body tissue by supersonic vibration transmitted to a treatment part by supersonic vibration transmission part.

[0013]

[Embodiment of the Invention]Hereafter, a 1st embodiment of this invention is described with reference to drawing 1 thru/or drawing 4. Drawing 1 shows the handpiece 1 of the ultrasonic coagulotomy device of this embodiment. This handpiece 1 is provided with the handle unit 2 shown in drawing 2, and the probe unit 3 and the vibrator unit 4 which are shown in drawing 3. And each above-mentioned units 2, 3, and 4 of the handpiece 1 of this ultrasonic coagulotomy device are assembled by the state which shows by drawing 1.

[0014]As shown in drawing 2, the operating section body 6 with the vibrator attaching part 5, the stationary handle 7 by the side of front [which was fixed to this operating section body 6], and the movable handle 8 of the rotating backside are formed in the handle unit 2. Here, the movable handle 8 is pivoted by the axial pin 9 screwed to the operating section body 6, and can be rotated now.

[0015]The base end of the long and slender insertion sheath part 10 is connected with the front end of the operating section body 6 via the rotating knob 11. Here, the insertion sheath part 10 and the rotating knob 11 are attached pivotable in same axle to the operating section body 6.

[0016]As shown in drawing 3, the ultrasonic vibrator (supersonic vibration generating part) is arranged in the cylindrical cover 12 at the vibrator unit 4. For example, this ultrasonic vibrator contained the element which changes an electrical signal into mechanical oscillation, it is formed with the Langevin type ultrasonic vibrator. The phon is connected with the front end of this ultrasonic vibrator. And the rear end part of the probe unit 3 thrusts at the tip of this phon, and it is connected in the state. The end part of the high frequency supply code

13 is connected to the electrode of an ultrasonic vibrator. The other end of this high frequency supply code 13 is connected to the electric power unit 14 of an RF generator as shown in drawing 1.

[0017]The cylindrical probe (vibration transmitting member) 15 which transmits supersonic vibration is formed in the probe unit 3. This probe 15 has high sound effects, and is formed with a good titanium material, an aluminum material, etc. of biocompatibility. And the connecting part 16 which stuffs the phon of the front end of an ultrasonic vibrator in the rear end part of this probe 15, and is connected in the state is formed.

[0018]The probe 15 is constituted by the tip flank article 15a and the back end flank article 15b. Adhesion connects with the screw clamp fixed between these two parts 15a and 15b.

[0019]Drawing 4 shows the transmission state of the supersonic vibration of the probe unit 3. The 0th abdomen 17a that serves as a belly of vibration in the position of the connecting part 16 of the rear end part of the probe unit 3 here, The 1st knot part 17b that serves as a paragraph of vibration in the approximately central position of the back end flank article 15b, The 1st abdomen 17c used as the belly of vibration, the second-article part 17d which serves as a paragraph of vibration in the approximately central position of the tip flank article 15a, and the 2nd abdomen 17e used as the belly of vibration in the position of the tip part of the tip flank article 15a are arranged at the connecting part of the tip flank article 15a and the back end flank article 15b, respectively. And between the 0th abdomen 17a and the 1st abdomen 17c is the half-wave length, and the probe 15 of this embodiment comprises the back end flank article 15b. Between the 1st abdomen 17c and the 2nd abdomen 17e is the half-wave length, and comprises the tip flank article 15a.

[0020]The treatment part 18 in contact with a treatment part is allocated by the tip part of the probe 15. The outside diameter size D1 of this treatment part 18 is formed in bigger shape (D1>D2) than the outside diameter size D2 of other portions of the nearly tip of the probe 15. Therefore, this treatment part 18 has the large mass per unit length.

[0021]The amplitude of the supersonic vibration generated with the ultrasonic vibrator is transmitted to this probe 15. Here, between the 1st knot part 17b of the probe 15, and the 1st abdomen 17c, the shape 19 to which the transformation ratio of amplitude is made to expand, for example, a taper taper part, is formed. And the supersonic vibration generated with the ultrasonic vibrator is told to the treatment part 18 where amplitude is expanded via this probe 15.

[0022]For vibration system, it will be in the state where load was applied at the tip of the probe 15, by enlarging mass of the treatment part 18 arranged near the 2nd abdomen 17e of the probe 15. Therefore, at the time of an ultrasonic oscillation, bigger pressure fluctuation can be added at which place between the 2nd abdomen 17e from the second-article part 17d or the second-article part 17d, and generation of heat can be produced locally. Thereby, the exothermic part 20 which generates heat at the time of transfer of supersonic vibration is formed in the circumference part of the treatment part 18 in the probe 15. And heat transfer of the heat of this exothermic part 20 is carried out to the treatment part 18 with a thick outer diameter at the tip of the probe 15.

[0023]When the units 2, 3, and 4 are assembled to the assembly state shown by drawing 1, the treatment part 18 at the tip of the probe 15 is projected from the tip part of the insertion sheath part 10 of the handle unit 2 in an outer side. And the jaw (gripping member) 21 currently supported between this treatment part 18 so that grasping of a body tissue is possible is allocated by the tip part of the insertion sheath part 10 of the handle unit 2. Here, the base end of the jaw 21 is connected with the tip part of the insertion sheath part 10 rotatable via the pivot 22.

[0024]Inside the insertion sheath part 10, the operation driving shaft of the shape of a wire which operates this jaw 21 which is not illustrated is allocated. And the base end of the jaw 21 is connected with the tip part of this operation driving shaft. The base end of this operation driving shaft is connected with the movable handle 8. And by being interlocked with operation of this movable handle 8, and an operation driving shaft's pushing on shaft orientations, and carrying out length operation, according to the moving operation of the shaft orientations of this operation driving shaft, a rotation drive is carried out a center [the pivot 22], and switching operation of the jaw 21 is carried out to the treatment part 18 at the tip of the probe 15. Thereby, between the treatment parts 18 at the tip of the probe 15, the jaw 21 is supported so that grasping of a body tissue is possible.

[0025]Next, an operation of the above-mentioned composition is explained. At the time of use of the handpiece 1 of the ultrasonic coagulotomy device of this embodiment, the handle unit 2, the probe unit 3, and the vibrator unit 4 are assembled by the assembly state shown by drawing 1. Ultrasonic coagulotomy treatment of a body tissue is performed in this state.

[0026]At the time of ultrasonic coagulotomy treatment, the gripping process which grasps a body tissue is performed first. In this gripping process, operation of making the movable handle 8 opening and closing to the

stationary handle 7 of the handle unit 2 is performed. By being interlocked with the operation which closes the open movable handle 8, and carrying out hauling operation of the operation driving shaft at the hand side, according to the moving operation of the shaft orientations of this operation driving shaft, a rotation drive is carried out a center [the pivot 22], and the jaw 21 is closed-operated to the treatment part 18 at the tip of the probe 15 at this time. Thereby, a body tissue is grasped between the jaw 21 and the treatment part 18 at the tip of the probe 15.

[0027]Thus, after grasping a body tissue between the probe 15 and the jaw 21, a supersonic vibration transfer process is performed. At this supersonic vibration transfer process, the supersonic vibration outputted from an ultrasonic vibrator is told to the treatment part 18 via the probe 15. The ultrasonic coagulating process to which it acts as a protein coagulation strange student of the grasping part of a body tissue with the frictional heat produced between the treatment part 18 of the probe 15 which grasps a body tissue at the time of transfer of this supersonic vibration, and the jaw 21 is performed.

[0028]At the time of an ultrasonic oscillation, mass by the supersonic vibration of the treatment part 18 of the large probe 15 The second-article part 17d of this probe 15, Or bigger pressure fluctuation is added at which place between the 2nd abdomen 17e, and generation of heat arises from the second-article part 17d locally in the exothermic part 20 of the circumference part of the treatment part 18 in the probe 15. Heat transfer of the heat of this exothermic part 20 is carried out to the treatment part 18 at the tip of the probe 15. And according to this ultrasonic coagulating process, the exothermic part 20 of the circumference part of the treatment part 18 at the tip of the probe 15 is made to generate heat, and the heat of this exothermic part 20 can be used for the coagulation of a body tissue.

[0029]An end of the coagulation treatment of a body tissue will perform an ultrasonic incision process after that. Excision of a body tissue is performed at this ultrasonic incision process by the cutting work by the supersonic vibration transmitted to the treatment part 18 by the probe 15.

[0030]The temperature of the exothermic part 20 which generates heat at the time of the coagulotomy treatment of a body tissue is controlling an output at 80 ** - about 250 **, and more effective coagulation / incision ability is obtained. The capability for the temperature of the exothermic part 20 at this time to have been stabilized when around 130 ** was preferred in the time of the treatment of oviduct coagulation etc. for example,

and there was generation of heat of not less than 100 ** at the time of the treatment of coagulation junction [of a blood vessel or an organ] - and incision is demonstrated.

[0031]However, since heat transfer will progress also to portions other than tip treatment part 18 if the temperature of the exothermic part 20 becomes an elevated temperature too much not much, unusual change of resonance frequency is produced and supersonic vibration becomes impossible. Since there is a possibility of having a thermal effect, by contact with the body tissue which the treatment part 18 of the probe 15 does not mean, the field of the exothermic part 20 which generation of heat at the tip of the probe 15 produces shall be around 20 mm, and it will be in the optimal condition of use to control exothermic temperature at 200 ** or less.

[0032]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, since the exothermic part 20 which generates heat at the time of transfer of supersonic vibration was formed in the circumference part of the treatment part 18 in the probe 15 in the handpiece 1 of the ultrasonic coagulotomy device of this embodiment, the exothermic part 20 at the tip of the probe 15 can be made to generate heat by adding supersonic vibration. Therefore, where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment, The frictional heat produced between the probe 15 and a body tissue and the heat of the exothermic part 20 can contribute to a body tissue complexly, and treatment which fully solidifies a body tissue can be performed in an instant in a short time. A body tissue is speedily detachable in an operation of supersonic vibration by maintaining the state where the body tissue was grasped between the probe 15 and the jaw 21.

[0033]Drawing 5 shows the 1st modification of the probe unit 3 of the ultrasonic coagulotomy device of a 1st embodiment. The probe unit 3 of this modification changes the shape of the probe 15 of a 1st embodiment a little as follows.

[0034]That is, in this modification, the shape 19 to which the transformation ratio of amplitude is made to expand, for example, a taper taper part, is formed like a 1st embodiment between the 1st knot part 17b of the probe 15, and the 1st abdomen 17c.

[0035]In this modification, the transformation ratio limb [major diameter / outside diameter size / of this treatment part 18] 31 is formed behind the treatment part 18 at the tip of the probe 15. And near the

second-article part 17d of the probe 15, the transformation ratio of amplitude is expanded by this transformation ratio limb 31.

[0036]In this modification, bigger pressure fluctuation (amplitude) is added at the place near the second-article part 17d of this probe 15 by the supersonic vibration of the transformation ratio limb 31 of the probe 15 with large mass at the time of supersonic vibration transfer of the probe 15. Therefore, since generation of heat arises locally in the transformation ratio limb 31 in the probe 15, heat transfer of the heat of this transformation ratio limb 31 is carried out to the treatment part 18 at the tip of the probe 15.

[0037]Then, the following effect is done so if it is in the thing of the above-mentioned composition. Namely, where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment in this modification, Since the frictional heat produced between the probe 15 and a body tissue and the heat by which heat transfer is carried out to the treatment part 18 from the transformation ratio limb 31 can be made to contribute to a body tissue complexly, treatment which fully solidifies a body tissue in this modification as well as a 1st embodiment can be performed in an instant in a short time.

[0038]Drawing 6 shows the 2nd modification of the probe unit 3 of the ultrasonic coagulotomy device of a 1st embodiment. The probe unit 3 of this modification changes the shape of the probe 15 of a 1st embodiment a little as follows.

[0039]That is, in the probe 15 of this modification, the greatest outer diameter part 41 of this probe 15 is formed between the 0th abdomen 17a of the back end flank article 15b, and the 1st knot part 17b. The minimum outside diameter part 42 whose outside diameter size D4 is sufficiently smaller than the outside diameter size D3 of the maximum outer diameter part 41 of the back end flank article 15b is formed in the tip flank article 15a of the probe 15 of this modification.

[0040]Therefore, since amplitude magnifying power becomes large enough in the probe 15 of this modification and the load stress state near the 2nd abdomen 17e also increases excessively, Generation of heat is produced near the 2nd abdomen 17e as a result, the heat is transmitted to the treatment part 18 at the tip of the probe 15, and good coagulation / incision capability can be obtained.

[0041]Drawing 7 (A) - (C) shows a 2nd embodiment of this invention. This embodiment changes the

composition of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0042]That is, at this embodiment, the tip flank article 15a of the half-wave length applied to the 2nd abdomen 17e from the 1st abdomen 17c of the probe 15 as shown in drawing 7 (A) is constituted from the 0th abdomen 17a by the member of another construction material in the back end flank article 15b of the half-wave length applied to the 1st abdomen 17c. For example, although titanium alloy:Ti-6aluminum-4Va is generally used as a material of an ultrasonic transfer member, as for the tip flank article 15a covered over the 2nd abdomen 17e from the 1st abdomen 17c, the stainless alloy is used in this embodiment.

[0043]This stainless alloy becomes possible [resonating, since a titanium alloy and specific acoustic impedance (density x acoustic velocity) are almost equal]. For example, since internal friction in a stainless material will be accumulated at an early stage from a titanium material if the amplitude of the supersonic vibration of the probe unit 3 makes not less than 50 micrometers output greatly, quantity of heat is accumulated near the second-article part 17d, and generation of heat can be generated easily. Therefore, since heat transfer of this heat can be carried out throughout treatment part of tip of probe 15 18, the effect as a 1st embodiment that this embodiment is also the same is acquired. As a different raw material from a titanium alloy, even if it uses carbon steel, an aluminum alloy material, etc. besides a stainless alloy, the same effect is acquired.

[0044]The surface of the tip flank article 15a covered over the 2nd abdomen 17e from the 1st abdomen 17c is coated for example, with the Teflon coating material which is antisticking material which prevents a body tissue from adhering. It can prevent a body tissue adhering to the probe 15 which generated heat enough by this, and barring coagulation and separation.

[0045]In this embodiment, as shown in drawing 7 (B), the peripheral face side of the treatment part 18 at the tip of the probe 15 is attached to the probe protect member 51 of approximately semicircle shape to wrap sectional shape by the tip part of the insertion sheath part 10 of the handle unit 2 fixed. This probe protect member 51 is arranged in the jaw 21 in the opposite hand, as shown in drawing 7 (C).

[0046]Then, the following effect is done so if it is in the thing of the above-mentioned composition. Namely, in this embodiment, since the wrap probe protect member 51 was formed, the peripheral face side of the

treatment part 18 at the tip of the probe 15, At the time of ultrasonic coagulotomy treatment, the probe protect member 51 can be arranged between body tissues other than the treatment part around the treatment part 18 at the tip of the probe 15, and the probe 15. Therefore, even if it is a case where the treatment part 18 at the tip of the probe 15 generates heat to an elevated temperature, the treatment part 18 at the tip of the probe 15 can be prevented from contacting body tissues other than the treatment part which a way person does not mean.

[0047]Although the probe protect member 51 is attached to the tip part of the insertion sheath part 10 of the handle unit 2 fixed, this probe protect member 51 may be attached to the tip part of the insertion sheath part 10 removable. In this case, exchange also becomes possible according to wear of the probe protect member 51, and the state of dirt.

[0048]Drawing 8 shows a 3rd embodiment of this invention. This embodiment changes the composition of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0049]That is, the obedient member 61 is being fixed to the treatment part 18 at the tip of the probe 15 in this embodiment. The material of this obedient member 61 has Teflon (registered trademark), preferred silicone rubber or heat-resistant plastic material, etc., for example. And in this embodiment, adhesion fixing of the obedient member 61 is carried out to the treatment part 18 at the tip of the probe 15. The fixing method of the obedient member 61 may not be limited to adhesion fixing, and may be screw fixation etc.

[0050]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, since the obedient member 61 fixed to the treatment part 18 of the probe 15 of this embodiment cannot follow the supersonic vibration speed of the probe 15, the fixing face of the treatment part 18 at the tip of the probe 15 and the obedient member 61 produces friction by the supersonic vibration of the probe 15, and it generates heat remarkably. Therefore, this heat can be made to contribute to raising the coagulation ability of a body tissue.

[0051]Drawing 9 (A) - (C) thru/or drawing 10 (A) - (C) shows a 4th embodiment of this invention. This embodiment changes the composition of the jaw 21 of the tip part of the insertion sheath part 10 in the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0052]Namely, the base member 71 which comprises rigid bodies, such as metal and a plastic material, as the jaw 21 of this embodiment is shown in drawing 9 (B), It is arranged at the opposed face side with the treatment part 18 of the probe 15 in this base member 71, and comprises the contact-carrying member 72 which consists of **** material (for example, Teflon etc.) in contact with a body tissue, and the saccate member 73 which consists of an elastic body arranged among those both. Inner fillers, such as a gas, a fluid, or gel, are enclosed with this saccate member 73. And this saccate member 73 can change freely by flow of an inner filler.

[0053]Next, an operation of this embodiment of the above-mentioned composition is explained. At the time of use of the handpiece 1 of this embodiment, as shown in drawing 9 (C) with the operation which closes the movable handle 8 from the state which opened the jaw 21 as shown in drawing 9 (A), the jaw 21 is closed-operated and a body tissue is grasped between the treatment part 18 of the probe 15, and the jaw 21. Here, For example, as shown in drawing 10 (A), in grasping the body tissue H whose thickness is not uniform between the treatment part 18 of the probe 15, and the jaw 21, as the arrow a shows in drawing 10 (A). If the retention span at the time of closing the jaw 21 acts on the body tissue H, according to the shape of surface type of the body tissue H, the inner filler in the saccate member 73 will flow and change. Drawing 10 (B) shows the power c applied to the applied force b of probe 15 HE, and the inner filler in the saccate member 73 to the retention span a of the jaw 21 in the state of drawing 10 (A), respectively. And since the holding face of the contact-carrying member 72 can maintain a suitable contact state to the surface of the body tissue H in connection with the deforming operation of the saccate member 73 at this time, it is possible to transmit power uniform about the whole holding face of the contact-carrying member 72.

[0054]In addition, by choosing the construction material, thickness, etc. of the saccate member 73, and specifying tension, when it is going to grasp the body tissue H by the retention span beyond default value. As shown in drawing 10 (C), saccate member 73 the very thing expands, and the power beyond default value can be prevented from attaining to the body tissue H by missing stress by this inflating part 73a.

[0055]Drawing 11 (A) - (C) and drawing 12 (A) and (B) show the modification of the jaw 21 in the handpiece 1 of the ultrasonic coagulotomy device of a 4th embodiment (drawing 9 (A) refer to - (C) thru/or drawing 10 (A) - (C)). This modification forms H type saccate member 81 which formed the shape of the saccate member 73 of a 4th embodiment in the shape of an abbreviated H character as shown in drawing 11 (B). The side parts 81a

and 81b of this H type saccate member 81 are arranged according to the lateral part of the base member 71 and the contact-carrying member 72, as shown in drawing 11 (A).

[0056]Then, the following effect is done so if it is in the thing of the above-mentioned composition. That is, in this modification, when grasping the body tissue H between the treatment part 18 of the probe 15, and the jaw 21, as shown in drawing 12 (B), the deformation direction of H type saccate member 81 can be specified intentionally. Here, as shown in drawing 11 (D), when the saccate member 73 of approximately rectangular shape is used, as it is shown in drawing 11 (E) at the time of modification of the saccate member 73 of this rectangular shape, when the center portion of this saccate member 73 swells, the stability of this saccate member 73 worsens. On the other hand, in H type saccate member 81 of this modification, the center portion of this H type saccate member 81 can be prevented from swelling also at the time of modification of this H type saccate member 81. Therefore, since the retention span which can raise more the stability of the holding face of the contact-carrying member 72, and joins the body tissue H by using H type saccate member 81 of this modification can be made uniformity and regularity, The stable coagulotomy capability can be demonstrated and the piece remainder etc. of the body tissue H by the modification which is not meant can be prevented.

[0057]Since wear by the holding face of the contact-carrying member 72 contacting the treatment part 18 of the probe 15 can also make it progress uniformly about the holding face whole region of the contact-carrying member 72, it is effective in the life of a product improving.

[0058]Drawing 13 and drawing 14 show a 5th embodiment of this invention. This embodiment changes the composition of the jaw 21 of the tip part of the insertion sheath part 10 in the handle unit 2 of the handpiece 1 of the ultrasonic coagulotomy device of a 1st embodiment (refer to drawing 1 thru/or drawing 4) as follows.

[0059]Namely, the base member 91 formed with rigid bodies, such as stainless steel metal, as the jaw 21 of this embodiment was shown in drawing 14, It is arranged at the opposed face side with the treatment part 18 of the probe 15 in this base member 91, and is constituted by the contact-carrying member 92 which consists of **** material (for example, Teflon etc.) in contact with a body tissue, and the heating element (heater element) 93 pinched among those both. This heating element 93 is a Nichrome wire etc. which are not illustrated, and heat energy is transmitted and it generates heat.

[0060]Next, an operation of the above-mentioned composition is explained. In this embodiment, while the

probe 15 is carrying out supersonic vibration, the output to the heating element 93 is impressed and the heating element 93 generates heat.

[0061]If a body tissue is grasped between the treatment part 18 of the probe 15, and the jaw 21 in this state, a body tissue is solidified with the heat from the heating element 93, and it can detach by the supersonic vibration of the probe 15 after that. ON/OFF of the output of the heating element 93 may synchronize with ON/OFF of supersonic vibration, and may be made to turn on and off according to a motion of the movable handle 8.

[0062]The heating element 93 of this embodiment is allocated in the back side of the contact-carrying member 92 which consists of a thin Teflon member, and heat transfer is carried out also to a side front. This heating element 93 is exposed to the surface of the contact-carrying member 92 which consists of Teflon material in part, and the convectivity to a body tissue increases further.

[0063]Then, since the heating element 93 was formed between the base member 91 of the jaw 21, and the contact-carrying member 92 if it was in the thing of the above-mentioned composition, Where a body tissue is grasped between the probe 15 and the jaw 21 by closing the movable handle 8 to the stationary handle 7 of the handle unit 2 at the time of ultrasonic coagulotomy treatment, The frictional heat produced between the probe 15 and a body tissue and the heat of the heating element 93 can contribute to a body tissue complexly, and treatment which fully solidifies a body tissue can be performed in an instant in a short time. A body tissue is speedily detachable in an operation of supersonic vibration by maintaining the state where the body tissue was grasped between the probe 15 and the jaw 21.

[0064]As for this invention, it is needless to say that modification implementation can be variously carried out in the range which is not limited to the above-mentioned embodiment and does not deviate from the gist of this invention. Next, other characteristic technical matters of this application are written in addition as follows.

Account (additional remark paragraph 1) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, An ultrasonic coagulotomy device characterized by a part of treatment part of said ultrasonic transfer member itself generating heat in the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member.

[0065](Additional remark paragraph 2) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, In the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member, An ultrasonic coagulotomy device which solidifies a body tissue using a part of treatment part of said ultrasonic transfer member itself generating heat, and is characterized by performing organization excision by supersonic vibration, and its method.

[0066](Additional remark paragraph 3) The supersonic vibration element part which generates supersonic vibration, and the ultrasonic transfer member which tells supersonic vibration to an operating area, An ultrasonic coagulotomy device which comprises a holding face which consists of a saccate member which said gripping member turns into from a rigid body and an elastic body, and an obedient member in the ultrasonic coagulotomy system provided with the movable free gripping member which is allocated by the tip part of this transmission part and grasps a body tissue between that ultrasonic transfer member.

[0067](Additional remark paragraph 4) Ultrasonic coagulotomy device with which a part of treatment part of said ultrasonic transfer member itself is characterized by in addition to this an ultrasonic transfer member being a dissimilar material in the additional remark paragraph 1.

[0068](Additional remark paragraph 5) Ultrasonic coagulotomy device characterized by coating a part of treatment part of said ultrasonic transfer member itself with the body tissue antisticking member in the additional remark paragraph 1.

[0069](Additional remark paragraph 6) Ultrasonic coagulotomy device provided with the heat transfer blocking member which a part of treatment part of said ultrasonic transfer member itself generates heat, and prevents the heat transfer to a body tissue in the additional remark paragraph 1.

[0070](Additional remark paragraph 7) Ultrasonic coagulotomy device, wherein the tip part mass of a treatment part itself [of said ultrasonic transfer member] is larger than the mass of a probe and makes it generate heat in the additional remark paragraph 1 at the time of supersonic vibration in addition to this.

[0071](Additional remark paragraph 8) Ultrasonic coagulotomy device characterized by a part of treatment part surface of said ultrasonic transfer member being 130 ** - 200 ** in the additional remark paragraph 1.

[0072](Additional remark paragraph 9) Ultrasonic coagulotomy device characterized by the body tissue prevention member of said ultrasonic transfer member being Teflon in the additional remark paragraph 5.

[0073](Additional remark paragraph 10) Ultrasonic coagulotomy device characterized by providing a heating element in said gripping member in the additional remark paragraph 1.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The side view showing the handpiece of the ultrasonic coagulotomy device of a 1st embodiment of this invention.

[Drawing 2]The side view showing the handle unit of the ultrasonic coagulotomy device of a 1st embodiment.

[Drawing 3]The side view showing the 1st probe unit and vibrator unit of an ultrasonic coagulotomy device of an embodiment.

[Drawing 4]The explanatory view for explaining the transmission state of the supersonic vibration of the probe unit of the ultrasonic coagulotomy device of a 1st embodiment.

[Drawing 5]The explanatory view for explaining the transmission state of the supersonic vibration in the 1st modification of the probe unit of the ultrasonic coagulotomy device of a 1st embodiment.

[Drawing 6]The explanatory view for explaining the transmission state of the supersonic vibration in the 2nd modification of the probe unit of the ultrasonic coagulotomy device of a 1st embodiment.

[Drawing 7]The side view in which an explanatory view for (A) to explain the transmission state of the supersonic vibration of the probe unit of an ultrasonic coagulotomy device and (B) show the treatment part of the end of the probe by showing a 2nd embodiment of this invention, and (C) are the perspective views.

[Drawing 8]The side view showing the probe unit of the ultrasonic coagulotomy device of a 3rd embodiment of this invention.

[Drawing 9]It is a perspective view in which the perspective view in which (A) shows the opened state of the jaw at the tip of the handpiece of an ultrasonic coagulotomy device, and (B) show the exploded perspective view of a jaw, and (C) shows the closed state of the jaw at the tip of the handpiece by showing a 4th embodiment of this invention.

[Drawing 10]It is a thing explaining the condition of use of the ultrasonic coagulotomy device of a 4th embodiment, As for the cross-sectional view of an important section showing the state where the body tissue was grasped by the treatment part of the end of the probe of an ultrasonic coagulotomy device, and (B), in (A), (C) is an explanatory view for explaining an operation of the retention span of a jaw, and an explanatory view for explaining the deformed state of a saccate member.

[Drawing 11]The modification of the jaw in the ultrasonic coagulotomy device of a 4th embodiment is shown, and, as for the 11C-11C line sectional view of (B), and (D), in the top view of the saccate member of a jaw, and (C), the top view of the saccate member of rectangular shape and (E) are [(A) / the exploded perspective view of a jaw, and (B)] the 11E-11 E-lines sectional views of (D).

[Drawing 12]As for (A), (B) is a perspective view showing H type saccate member of the modification of drawing 11, and a cross-sectional view of an important section showing the state where the body tissue was grasped by the treatment part of the end of the probe.

[Drawing 13]The side view showing the handle unit of the ultrasonic coagulotomy device of a 5th embodiment of this invention.

[Drawing 14]The side view showing the jaw at the tip of the handpiece of the ultrasonic coagulotomy device of a 5th embodiment.

[Description of Notations]

4 Vibrator unit

15 Probe (vibration transmitting member)

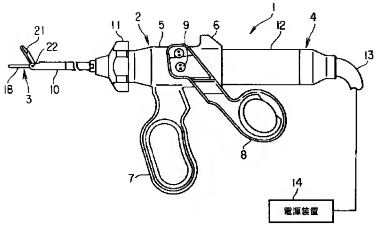
18 Treatment part

20 Exothermic part

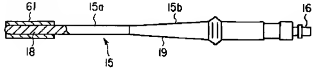
21 Jaw (gripping member)

DRAWINGS

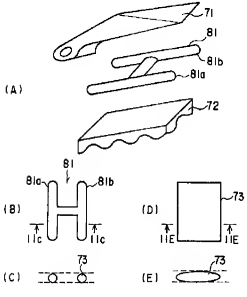
[Drawing 1]



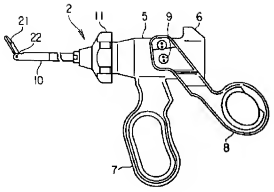
[Drawing 8]



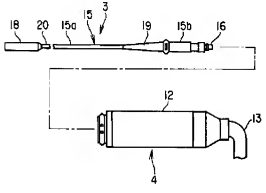
[Drawing 11]



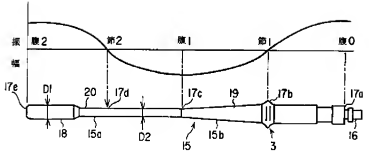
[Drawing 2]



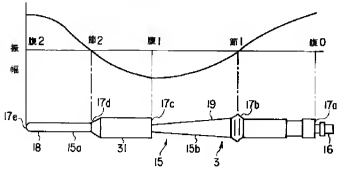
[Drawing 3]



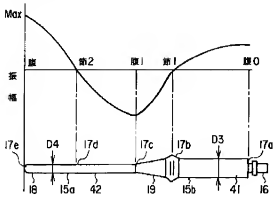
[Drawing 4]



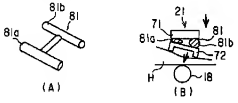
[Drawing 5]



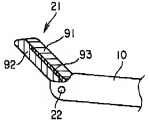
[Drawing 6]



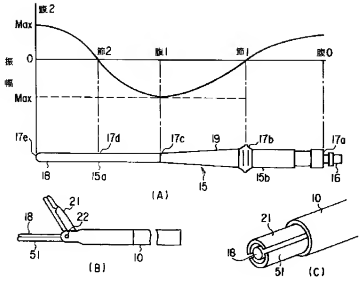
[Drawing 12]



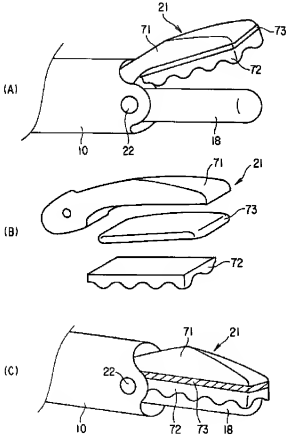
[Drawing 14]



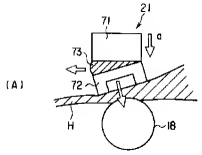
[Drawing 7]

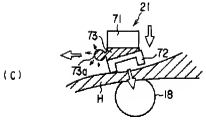


[Drawing 9]



[Drawing 10]





[Drawing 13]